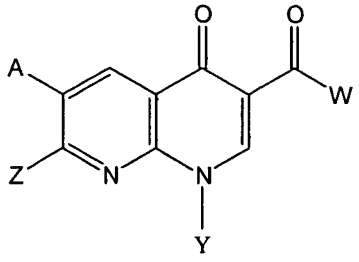
Claims

What is claimed is:

1. A compound having the formula:



(1)

and pharmaceutically acceptable salts, esters and prodrugs thereof;

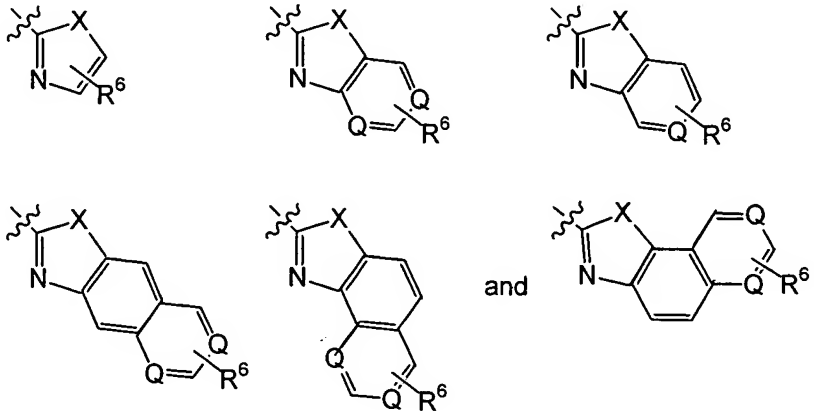
wherein W and Z are independently OR^2 or NR^1R^2 wherein R^1 and R^2 may form an optionally substituted ring;

A is H, halo or NR^1_2;

R^1 is H or a $C_{1\text{-}6}$ alkyl;

R^2 is H or a $C_{1\text{-}10}$ alkyl or $C_{2\text{-}10}$ alkenyl optionally containing one or more non-adjacent heteroatoms selected from N, O, and S, and optionally substituted with a carbocyclic or heterocyclic ring; or R^2 is an optionally substituted heterocyclic ring, aryl or heteroaryl;

Y is selected from the group consisting of



where R^6 is a substituent at any position on the fused ring; and is H, OR^1, $C_{1\text{-}6}$ alkyl, $C_{2\text{-}6}$ alkenyl, each optionally substituted by halo, =O or one or more heteroatoms; or R^6 is an inorganic substituent; or two adjacent R^6 is linked to obtain a 5-6 membered substituted or unsubstituted

carbocyclic or heterocyclic ring, optionally fused to an additional substituted or unsubstituted carbocyclic or heterocyclic ring;

Q is CH or N;

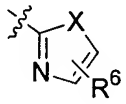
and X is O, NH, or S;

provided that W is not hydroxy or ethoxy when Y is 2-thiazolyl or Z is 3-amino-1-pyrrolidinyl.

2. The compound of claim 1, wherein A is halo.

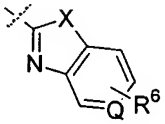
3. The compound of claim 2, wherein said halo is fluoro.

4. The compound of claim 1, wherein Y has the formula



where X is S and R_6 is H;

or the formula



where X is S, Q is CH, and R_6 is H.

5. The compound of claim 1, wherein W and Z are independently NR^1R^2.

6. The compound of claim 5, wherein R^1 is H and R^2 is a $C_{1\text{-}10}$ alkyl optionally containing one or more heteroatoms, and optionally substituted with a $C_{3\text{-}6}$ cycloalkyl, aryl or a 5-14 membered heterocyclic ring containing one or more N, O or S.

7. The compound of claim 6, wherein said 5-14 membered heterocyclic ring is selected from the group consisting of tetrahydrofuran, 1,3-dioxolane, 2,3-dihydrofuran, tetrahydropyran, benzofuran, isobenzofuran, 1,3-dihydro-isobenzofuran, isoxazole, 4,5-dihydroisoxazole, piperidine,

pyrrolidine, pyrrolidin-2-one, pyrrole, pyridine, pyrimidine, octahydro-pyrrolo[3,4-*b*]pyridine, piperazine, pyrazine, morpholine, thiomorpholine, imidazole, imidazolidine-2,4-dione, benzimidazole, 1,3-dihydrobenzimidazol-2-one, indole, thiazole, benzothiazole, thiadiazole, thiophene, tetrahydro-thiophene 1,1-dioxide, diazepine, triazole, guanidine, diazabicyclo[2.2.1]heptane, 2,5-diazabicyclo[2.2.1]heptane, and 2,3,4,4a,9,9a-hexahydro-1H-β-carboline.

8. The compound of claim 5, wherein R^1 is H and R^2 is an aryl or a 5-14 membered heterocyclic ring containing one or more N, O or S, each optionally substituted with an amino or another heterocyclic ring.

9. The compound of claim 8, wherein said 5-14 membered heterocyclic ring is selected from the group consisting of tetrahydrofuran, 1,3-dioxolane, 2,3-dihydrofuran, tetrahydropyran, benzofuran, isobenzofuran, 1,3-dihydro-isobenzofuran, isoxazole, 4,5-dihydroisoxazole, piperidine, pyrrolidine, pyrrolidin-2-one, pyrrole, pyridine, pyrimidine, octahydro-pyrrolo[3,4-b]pyridine, piperazine, pyrazine, morpholine, thiomorpholine, imidazole, imidazolidine-2,4-dione, benzimidazole, 1,3-dihydrobenzimidazol-2-one, indole, thiazole, benzothiazole, thiadiazole, thiophene, tetrahydro-thiophene 1,1-dioxide, diazepine, triazole, guanidine, diazabicyclo[2.2.1]heptane, 2,5-diazabicyclo[2.2.1]heptane, and 2,3,4,4a,9,9a-hexahydro-1H-β-carboline.

10. The compound of claim 5, wherein R^1 and R^2 in NR^1R^2 form an optionally substituted 5-14 membered ring containing one or more N, O or S.

11. The compound of claim 10, where NR^1R^2 is morpholine, thiomorpholine, piperazine, piperidine or diazepine.

12. The compound of claim 1, wherein W and Z independently have the formula

$$NR^1 - (CR^1{}_2)n - NR^3R^4 \qquad (2)$$

wherein R^1 and R^3 are independently H or $C_{1\text{-}6}$ alkyl;

n is 1-6; and

R^4 is H or a C_{1-10} alkyl or C_{2-10} alkenyl optionally containing one or more non-adjacent heteroatoms selected from N, O and S, and optionally substituted with a carbocyclic or heterocyclic ring; and

wherein R^3 and R^4 in NR^3R^4 may form an optionally substituted ring.

13. The compound of claim 12, wherein n is 2-3.

14. The compound of claim 12, wherein NR^3R^4 is an acyclic amine, or guanidinyl or a tautomer thereof; or R^3 and R^4 optionally form a substituted ring containing one or more N, O or S.

15. The compound of claim 12, wherein NR^3R^4 is morpholine, thiomorpholine, imidazole, pyrrolidine, piperazine, pyridine or piperidine.

16. The compound of claim 1, wherein Z is NR^1R^2; and W has the formula

$$NR^1 - (CR^1{}_2)_n - NR^3R^4 \qquad (2)$$

wherein R^1 and R^2 are as defined in claim 1;

R^3 is H or C_{1-6} alkyl;

n is 1-6; and

R^4 is H or a C_{1-10} alkyl or C_{2-10} alkenyl optionally containing one or more non-adjacent heteroatoms selected from N, O and S, and optionally substituted with a carbocyclic or heterocyclic ring; and

wherein R^1 and R^2 in NR^1R^2; and R^3 and R^4 in NR^3R^4 each independently may form a substituted ring.

17. The compound of claim 16, wherein R^1 and R^2 in NR^1R^2; and R^3 and R^4 in NR^3R^4 each independently form a substituted ring containing one or more N, O or S.

18. The compound of claim 17, wherein Z is optionally substituted with amino, carbamate, a C_{1-10} alkyl containing one or more non-adjacent N, O or S, and optionally substituted

with a heterocyclic ring; aryl or a saturated or unsaturated heterocyclic ring, each of which is optionally substituted.

19. The compound of claim 17, wherein Z is substituted with a heterocyclic ring selected from the group consisting of tetrahydrofuran, 1,3-dioxolane, 2,3-dihydrofuran, tetrahydropyran, benzofuran, isobenzofuran, 1,3-dihydro-isobenzofuran, isoxazole, 4,5-dihydroisoxazole, piperidine, pyrrolidine, pyrrolidin-2-one, pyrrole, pyridine, pyrimidine, octahydro-pyrrolo[3,4-*b*]pyridine, piperazine, pyrazine, morpholine, thiomorpholine, imidazole, imidazolidine-2,4-dione, benzimidazole, 1,3-dihydrobenzimidazol-2-one, indole, thiazole, benzothiazole, thiadiazole, thiophene, tetrahydro-thiophene 1,1-dioxide, diazepine, triazole, guanidine, diazabicyclo[2.2.1]heptane, 2,5-diazabicyclo[2.2.1]heptane, and 2,3,4,4a,9,9a-hexahydro-1H-β-carboline.

20. The compound of claim 17, wherein Z and NR^3R^4 are independently morpholine, thiomorpholine, imidazole, pyrrolidine, piperazine, pyridine or piperidine.

21. The compound of claim 20, wherein Z and NR^3R^4 are independently pyrrolidine.

22. The compound of claim 21, wherein Z is substituted with pyrazine.

23. The compound of claim 1, wherein W is OR^2 and R^2 is a C_{1-6} alkyl optionally substituted with a carbocyclic or heterocyclic ring.

24. The compound of claim 1, wherein each optionally substituted moiety is substituted with one or more halo, OR^2, NR^1R^2, carbamate, C_{1-10} alkyl, C_{2-10} alkenyl, each optionally substituted by halo, =O, aryl or one or more heteroatoms; inorganic substituents, aryl, carbocyclic or a heterocyclic ring.

25. The compound of claim 1, wherein said compound is chiral.

26. The compound of claim 1, wherein said compound is selected from the compounds in Table 1.

27. A pharmaceutical composition comprising the compound of claim 1, and a pharmaceutically acceptable carrier.

28. A method for identifying a compound that interacts with a quadruplex-forming region of DNA, comprising

a) contacting a nucleic acid capable of forming a quadruplex with a primer comprising a label to form a complex;

b) contacting said complex with one or more test compounds and a polymerase to form a reaction mixture, and

c) separating said reaction mixture by capillary electrophoresis to obtain one or more reaction products; and

d) determining the extent of primer extension in said one or more reaction products.

29. The method of claim 28, further comprising the step of determining the binding affinity of said one or more test compounds for said nucleic acid.

30. The method of claim 28, wherein said label is a fluorescent label.

31. A method for ameliorating a cell proliferative disorder, comprising administering to a subject in need thereof an effective amount of the compound of claim 1 or a pharmaceutical composition thereof, thereby ameliorating said cell-proliferative disorder.

32. The method of claim 31, wherein said cell proliferative disorder is cancer.

33. The method of claim 31, wherein cell proliferation is reduced, or cell death is induced.

34. The method of claim 31, wherein said subject is human or an animal.

35. A method for reducing cell proliferation or inducing cell death, comprising contacting a system with an effective amount of the compound of claim 1 or a pharmaceutical composition thereof, thereby reducing cell proliferation or inducing cell death in said system.

36. The method of claim 35, wherein said system is a cell or tissue.

37. A method for reducing microbial titers, comprising contacting a system with an effective amount of the compound of claim 1 or a pharmaceutical composition thereof, thereby reducing microbial titers.

38. The method of claim 37, where the system is a cell or tissue.

39. The method of claim 37, wherein the microbial titers are viral, bacterial or fungal titers.

40. A method for ameliorating a microbial infection, comprising administering to a subject in need thereof an effective amount of the compound of claim 1 or a pharmaceutical composition thereof, thereby ameliorating said microbial infection.

41. The method of claim 40, where the subject is a human or an animal.

42. The method of claim 40, wherein said microbial infection is viral, bacterial or fungal.